Letters to the Editor.

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Spectrum of the Night Sky.

I HAVE now succeeded in obtaining a spectrogram showing the general features of the spectrum of the night sky in the south of England, with the moon below the horizon. The exposure given was about 50 hours, beginning each night not earlier than 2½ hours after sunset, and closing about midnight. There appears, therefore, to be no possibility that sunlight or moonlight intervened.

The spectrum shows the bright yellow-green aurora line very strongly. There is a continuous spectrum corresponding in distribution to the solar spectrum, and showing the dark Fraunhofer lines H and K. These are perfectly definite. The exposure is not enough to show the other Fraunhofer lines definitely, and, in any case, the instrument used is only capable of showing a few of the strongest of them.

There is no trace on this plate of the nitrogen bands, which form so conspicuous a part of the spectrum of the polar aurora. From some exposures I have made in the neighbourhood of Newcastle, three degrees farther north, I believe that the negative bands of nitrogen are a normal feature of the night-sky spectrum there. But more work is required on this point.

RAYLEIGH.

Terling Place, Witham, Essex.
November 25.

Medical Education.

IT is stated in NATURE (November 18, p. 683) that "The professional course has grown so full in the training of a medical student that it has become increasingly difficult to cover the ground and secure qualification in a reasonable time." It seems that chemistry and physics are to be placed outside the professional curriculum, but biology is to be retained. A knowledge of chemistry and physics is necessary to the doctor; and much of the recent advance in both medicine and surgery is due to discovery in these sciences. But can any one tell us of what utility, practical or intellectual, is the biology which medical students learn—facts about the classification of plants, the vascular system of the sea-urchin, the digestive system of the leech, the bones in the cod's head, and so on? No one is a better physician or surgeon for such knowledge; and, therefore, since it has no bearing on later study and practice, it is forgotten as soon as the prescribed examinations are passed.

For the medical man the intellectual value of biology should lie, if anywhere, in interpretation. It should cause him to think. He should learn man's place in Nature—how he resembles and differs from other living beings, and how these likenesses and differences arose. Man is in body and mind above all the educable, the trainable, the adaptive being. From birth forwards he develops mainly in response to use. He is rational and intellectual because his mind grows through functional activity. That is his special distinction; that places him in Nature. The medical student learns nothing of all this. He may be taught, incidentally as it were, that some characters are inborn, or acquired, or inheritable. But a year or so later, physiologists and pathologists tell him the quite indisputable truth that every character takes origin in germinal potentiality (predisposition, diathesis), and arises in response to some sort of nurture—*i.e.* that every character is equally innate, acquired, and inheritable. If the student thinks at all, he must conclude, as Prof. Armstrong says very truly in another connexion (NATURE November 11, p. 648), "We are mouldering away in our laboratories and when we seek to make known what we have been doing we use a jargon which we cannot ourselves understand."

The medical student may be told that Natural Selection is an interesting speculation, but that no man has seen it in operation. Again, if he thinks, he will conclude that, owing to defective opportunities for observation, no man *could* see Natural Selection in operation among the wild animals and plants which biologists study. Nevertheless, a year or two later he will perceive it in full swing in the case of tuberculosis and every other lethal and prevalent human disease, and will learn that every human race is resistant to every human disease precisely in proportion to the length and severity of its past experience of that disease. There are scores of diseases and hundreds of races and sub-races of mankind; and, therefore, in some thousands of instances—whenever and wherever close observation is possible—he will find Natural Selection causing adaptive evolution. Moreover, he will learn that just as human races alter gradually in powers of resistance, so, at the other end of the scale, bacterial races alter in virulence when removed from one kind of animal to another, a thing quite inexplicable except on grounds of Natural Selection.

The student may be taught that effective selection occurs among mutations, not fluctuations. A year or so later he will perceive tuberculosis selecting amid all shades of difference, with the result that races present all shades of evolution. He may be taught that mutations segregate and that their inheritance is alternate. A year or so later he will learn that human mutations (*e.g.* idiocy, hare-lip, club-foot) are inherited, perhaps for many generations, in a patent or latent condition, and that only their reproduction is alternate. Moreover, he will wonder, if mutations segregate, how it happens that long-lost ancestral traits sometimes reappear in *purely bred* domesticated varieties (*e.g.* pigeon, poultry, and many plants). He may be taught that evolution depends on mutations and that mutations do not blend. A year or two later he will learn that human races never differentiate while there is inter-breeding, but diverge rapidly and infallibly when separated by time and space; that, though men are fond of telling about wonders, yet in the whole of written human history (4000 years or more) no useful human mutation has been recorded, nor one that changed the type of a race; that all human varieties (*e.g.* negro and white), like all natural varieties (*e.g.* brown and polar bear), blend perfectly when crossed in all characters except those linked with sex; and, lastly, that "lost" ancestral traits never reappear except when one of the parties to the cross is derived from a domesticated variety. If he thinks at all, he will conclude that Natural Selection is founded on fluctuations, but that man, as Darwin noted, "often begins his selection by some half-monstrous form, or at least by some modification prominent enough to catch the eye or to be plainly useful to him." He may be taught that the doctrine of recapitulation is doubtful. But if he thinks at all, he will perceive that any other mode of evolution and development is totally inconceivable. And so on.

The point I wish to emphasise is that medical men, with an acquaintance with man infinitely more

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intimate than any biologist can have with any animals or plants, with abundance of direct, not merely circumstantial evidence, have no need for the traditional biology of biological teachers. They are in a position to construct, and for all practical purposes have already constructed, a biology of their own. The traditional teaching has with them no influence whatever except as a waste of time, and ought to be, and before long is sure to be, eliminated from a curriculum which has outgrown it.

G. ARCHDALL REID.

9 Victoria Road South, Southsea,
November 19.

Divided Composite Eyes.

IT is not uncommon to find among insects instances where each composite eye is divided into two portions, so that in appearance there seem to be four eyes instead of two. In sections, however, it is seen that both parts are connected with the same ganglion.

Sometimes the reason for the division is obvious, as in the case of certain beetles which have a prominent sort of "armoured belt" carried horizontally round the head. Here half the eye is above and half below the belt, thus giving a view of the ground as well as of objects above it.

The reason for duplication, however, is not always so apparent. In the majority of composite eyes the convex surface is covered with lenses of uniform size, but in those to which the present note relates, namely, dragon-flies, White (or Cabbage) fly, and Aphides, this is not the case.

Among the dragon-flies—a very highly developed type—each eye presents a continuous convex surface, but the lenses of the upper part are much larger than those below. The transition from large to small is quite abrupt, but as the curvature of the surface is continuous the line of demarcation is not noticeable without the use of a magnifying glass.

In the White-fly (*Aleyrodes proletella*, etc.), where the eyes are well divided, the relative position of the large and small lenses is reversed, the large lenses being below.

The eyes of Aphides present for the greater part of their area a convex surface carrying lenses of equal diameter, but not far from the posterior margin there is a small prominence bearing a few lenses on its summit and sides.

The appearance of the eyes of dragon-flies is so well known that it is scarcely necessary to give figures, but it may be remarked that the areas covered respectively by the large and small lenses differ considerably both in form and extent in different genera.

White-fly is chiefly known as a pest in greenhouses, and until its appearance in unusual numbers in the autumn of 1921, I had never given it any attention. Any one, however, who examined the perfect insect with a magnifying glass might well be excused for taking it (as did Linnæus) for a small moth, but if the course of its development is followed up from the egg to the imago it is seen to be more nearly allied to the Aphides.

Far the best account of it is given by Reaumur ("Memoires," Tome II.) in 1736, and having myself repeated his observations of its transformations, I can confirm the accuracy of his description. All Reaumur's specimens were apparently taken from the leaves of *Chelidonium majus*, but this plant is not abundant in the neighbourhood of Exeter. White-fly, however, feeds on a great variety of leaves, and I have taken it from cabbage, cucumber, tomato, campanula, veronica, and from many composites. There is a considerable difference in these cases both in the size of the perfect insects and in the density of the cottony down with which they are coated, which gives them their white appearance, but whether this implies real specific differences or is only a result of different food, is, I believe, considered uncertain. Among my own specimens, those taken from cucumber were the smallest in size and had the thinnest coating of down. The divided eyes were closely similar in all, and the general appearance of the insect is shown in the camera-lucida sketches, Fig. 1. When the head is viewed from underneath, especially when it is so turned that only the lower pair of eyes are visible, the face is curiously owl-like, the proboscis standing for the beak.

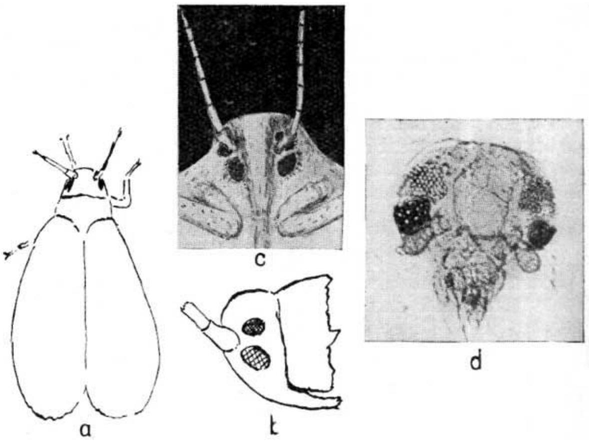

FIG. 1.—Aleyrodes.

a, Camera-lucida sketch of *A. proletellæ* × 25.
b, Head, side view.
c, Head, from below.
d, Head × 125 (60 in the reproduction), front view to show the difference in the size of the lenses in the two divisions of the eye. The contents of the head and the exterior down have been removed. The specimen was taken from cucumber. Diameter of upper lenses 0·0003 in., of lower lenses 0·0005 in.

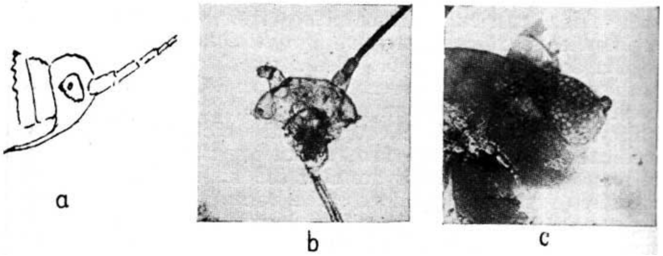

FIG. 2.—Black Aphis taken from Laburnum.

a, Head, side view.
b, Head, front view × 50.
c, Eye and part of head × 125 (60 in the reproduction), seen from above.

The eyes are shown in more detail in the photograph, Fig. 1.

There is always some difficulty in photographing such objects as require large magnification, but the structure of which does not permit of these being flattened; and though much less detail is shown in Fig. 1 *c* than can be made out by focussing each part independently, the difference in the size of the upper and lower groups of lenses is very apparent.

Several species of Aphis taken from various plants were examined, and in all of them the eyes had the

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